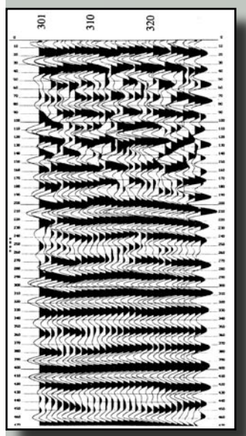
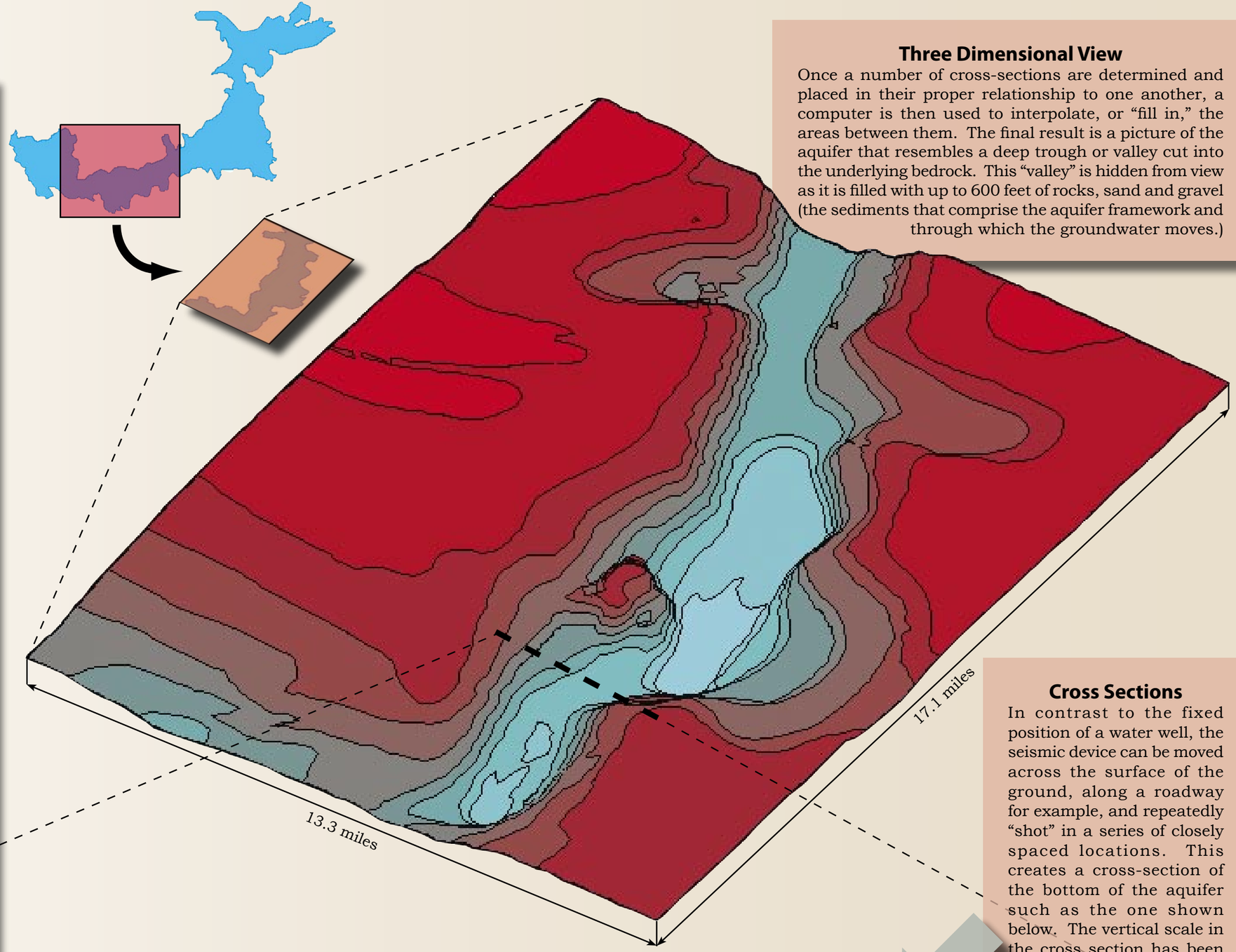
Exploring the Aquifer

Unlike a river where you can easily see the water flowing down the channel, it is difficult - if not impossible - to actually see the water moving beneath the ground in an aquifer. Therefore, geologists use a variety of tools to visualize the shape and extent of an aquifer, to map the groundwater table surface, and to better understand the flow of groundwater within this subterranean reservoir. These tools include something as simple as drilling a well into the ground to the high tech use of seismic energy.

Drilling a water well provides information at a single point in the aquifer, such as depth to the water table and maybe the thickness of the aquifer. It is also useful to periodically take water level measurements to see how the water table moves up and down with the seasonal changes in recharge and discharge of the aquifer. Water wells also provide a point where water samples can be taken for purposes of monitoring water quality through time. However, wells are very expensive to drill and provide information at only one point in the aquifer - they can't provide much information about the other parts of an aquifer system.



To visualize the shape of the aquifer across a larger area a SeisPulse™ device was used to map out the bottom of the Aquifer so that scientists could better determine the volume of water underground. This device uses seismic energy - actually sound waves created by small, contained explosions directed downward at the Earth - much like ultra-sound technology is used to look inside the human body. A geophone set nearby listens for the reflected return vibrations from deep underground. The geophone records the reflected sound waves on a chart (an example is shown at left). By knowing the velocity of sound in sand and gravel one can estimate the thickness of the aquifer by carefully measuring the time the sound energy takes to travel down and back.



Three Dimensional View

Once a number of cross-sections are determined and placed in their proper relationship to one another, a computer is then used to interpolate, or "fill in," the areas between them. The final result is a picture of the aquifer that resembles a deep trough or valley cut into the underlying bedrock. This "valley" is hidden from view as it is filled with up to 600 feet of rocks, sand and gravel (the sediments that comprise the aquifer framework and through which the groundwater moves.)

Cross Sections

In contrast to the fixed position of a water well, the seismic device can be moved across the surface of the ground, along a roadway for example, and repeatedly "shot" in a series of closely spaced locations. This creates a cross-section of the bottom of the aquifer such as the one shown below. The vertical scale in the cross section has been exaggerated two times (2X).